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Original scientific paper

Refractive Errors in Children of Primorsko--Goranska County – Epidemiological study

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A B S T R A C T

Three institutions: Teaching Institute of Public Health of Primorsko-Goranska County, Croatian Association »Albert Einstein« and Eye Clinic »Dr B.Vojniković« Rijeka agreed a five-year project to study children´s health status of vision at Primorsko-Goranska County. Main task was the study of damage of vision in children due to prolonged sun exposure. Examination were conducted on a three locations, with the assumption of varying insolation: Island of Rab, Novi Vinodolski and Delnice. The study included children aged between 9 to 14 years. The study included 189 children. Except routine ophthalmologic examinations in addition were preformed biomicroscopic examination of the anterior segment of the eye, intraocular pressure and eye fundus. In a certain number of children with suspect of a specific disease (macular degeneration, glaucoma and refractive error), additional tests were performed: glaucoma treatment, field of vision, optical coherence tomography (OCT) of the eye and detailed eye refraction. This study specifically addressed of refractive error at that three different regions. It was found that the most difficult situation was at the Novi Vinodolski where as many as 40% of children have a refractive error, followed by Island of Rab with 17% and Delnice with 9%. Especially like to mention that on the island of Rab, 50–60 years ago, it was a very rare occurrence of some refractive errors in children.

***Key words**: childhood, refractive error, epidemiological study, Primorsko-Goranska County, Croatia*

Introduction

Detection of refractive anomalies should begin at the earliest childhood, not forgetting the fact that the whole organism develop and the organ of vision too[1]. Optical system is mainly stabilized upon completion of puberty. When determining the refraction of the eye during childhood it is essential to take into account its development. It is known that the majority of children are born with a moderate physiological hyperopia and even moderate astigmatism. Therefore refractive prescriptions in children necessarily included that factor and frequent vision tested, and additional correction previous health findings. If hyperopia is physiological phenomenon during the development of the child, then we need to access with great care accessed moderate hyperopia correction. Some authors believe, and we agree with them, that in puberty moderate hyperopia is not corrected, if all the other parameters of ophthalmologic examination within the normal range.

The aim of this study was to determine the status of refractive errors in certain places. It is an important fact when one wants to examine the condition of vision in a particular area. So for example if you are on Island of Rab you can expect a normal medical examination of refraction of the eye, while on the island of Cres, Krk and Losinj can expect all refractive anomalies, and even very

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often crossed oblique cilindar. On the island of Rab, in a certain percentage we will not achieve normal findings of visus despite there being no refractive error. This is due to the rather frequent occurrence of initial macular degeneration and glaucoma during childhood. For these reasons, in our study of refractive anomalies in children we have included the detection of other eye diseases, especially macular degeneration and glaucoma.

Materials and Methods

The state of vision was examined in children between the ages 9–14 years in areas of the Island of Rab, Novi Vinodolski and Delnice, in the Primorsko-Goranska County. These regions were selected primarily because of study of the impact of various solar insolation on the organ of vision. The four-year study included 189 children with routine ophthalmologic examinations: external eye examination, visus, biomicroscopic examination of the anterior segment of the eye, intraocular pressure and fundus. For more accurate epidemiological studies of organs of vision disorders in addition were taken detailed history and possibly the origin of the parents. In those children, where they found a certain deviation, were sent to more detailed tests, such as: sciascopia, glaucoma treatment, visual field, macular tresholds, examination of fundus, ultrasound and optical coherence tomography (OCT) of the eye.

Results

In Table 1 is presented eye pathology diagnosed in children of these areas of Primorsko-Goranska County. From the epidemiological point of view it is interesting to note the frequency of certain differences in the pathology of the eye in particular regions. Macular Degeneration-AMD is the most common on the island (15%), followed by Novi Vinodolski (11%), and Delnice in 4%. Glaucoma during childhood is most common on the island Rab (8%), while in Delnice and Novi Vinodolski appears equally (3–4%). Most important for our study are refractive eye abnormalities, which are astoundingly concentrated in such a high percentage of 40% at region of Novi Vinodolski, 9% in Delnice and 17% on the island of Rab. From the epidemiological point of view it is interesting to emphasize that the most complex demographic structure of the population is in Novi Vinodolski (25%), followed Delnice (15%) and the island of Rab (3%).

Table 2 shows the distribution and frequency of certain refractive errors by region in which the study was conducted. The analysis shows that the most common refractive anomalies are in Novi Vinodolski, then in Gorski Kotar, and at least on Rab Island, which corresponds to the proportion of the demographic diversity of the population of these particulary regions. In terms of type of refractive anomalies most common is hyperopia, followed by myopia in all areas. In terms of astigmatism, it is also the most common in Novi Vinodolski, then on island of Rab and at least in Delnice. With-the-rule astigmatism is present in a greater percentage of against-the-rule astigmatism. Oblique astigmatism is the least represented among respondents from all areas, and on island of Rab was not registered.

Discussion and Conclusion

Analyzing individual regions from epidemiological aspects we have to take into account the demographic migration of the population, in this case mostly from Bosnia and Herzegovina, and much less from Slavonia, which substantially reflects the state of refraction of the eye. Especially interesting is the island of Rab, where appear

TABLE 1
ANALYSIS AND DETECTION IN CHILDHOOD OF REFRACTIVE ERROR, MACULAR DEGENERATION AND GLAUCOMA IN PRIMORSKO-GORANSKA COUNTY

Destination	Number of children	Refractive error (%)	AMD* (%)	Glaucoma (%)
The Island of Rab	62	17	15	8
Delnice	86	9	4	3
Novi Vinodolski	41	40	11	4

*AMD – Age related macular degeneration

TABLE 2
REFRACTIVE ERROR OF THE EYE IN CHILDHOOD IN PRIMORSKO-GORANSKA COUNTY

Destination	Refractive error				
	Myopia (%)	Hyperopia (%)	Astigmatism		
			With-the-rule (%)	Against-the-rule (%)	Oblique
The Island of Rab	5.0	9.5	2.0	0.5	–
Delnice	2.5	4.5	1.0	0.5	0.5
Novi Vinodolski	6.0	21.5	6.0	4.0	2.5

today refractive error, although moderate sizes, but considering the fact that sixty years ago practically there was no child who wears glasses. Delnice with moderate refractive anomalies, while Novi Vinodolski lead with even 21.5% of hyperopia and 6% of myopia. The analysis indicates that there are no severe refractive anomalies, and oblique astigmatism appears in a very low percentage of 0.5% in Delnice and 2.5% in Novi Vinodolski. In children with moderate hyperopia which is found in the largest number of respondents it is expected that hyperopia decrease or disappear until puberty considering these are children between the ages of 9 to 14 years. It is known that the axial length of the bulbus grows until puberty when it reaches a value of 22 to 25 mm[1–4]. Lens and cornea has less impact in the reduction and disappearance of hyperopia until puberty in the physiological conditions of the axial length of bulbus. In subjects besides refractive anomalies we found also glaucoma and macular degeneration. These two diseases do not have direct cause not even genetic with refractive anomalies other than pigmented glaucoma which can not appear[3]. What is important to emphasize here that these diseases affect the reduction of visual acuity and it is necessary to take into consideration in determination of the refraction. Insist on normal vision during the determination of refraction, and not take into account the damage of vision by these diseases, represents an unnecessary and toilsome work during the determination of eye refraction. Previous studies prove that macular degeneration occurs already during childhood, due to excessive exposure to sunlight[5]. In this disease leads island of Rab, followed by Novi Vinodolski and then Gorski Kotar, exactly in proportion to the strength of insolation. All of this points to the following: refractionist, whatever profile, must in the course of determining of eye refraction include the child's medical history and have previous findings about the health of the eye. Often in children, when during the of refraction of the eye is not achieved normal vision, a condition marked as »amblyopia« and, therefore, it is one of the most complex findings in ophthalmology, and if you want »most odious.« This indicates that there is no prescription correction, especially in children, if we do not have previous ophthalmic findings about the health status of the eyes.

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REFRAKTERNE ANOMALIJE DJECE U PRIMORSKO-GORANSKOJ ŽUPANIJI – EPIDEMIOLOŠKA STUDIJA

SAŽETAK

Tri institucije: Nastavni zavod za javno zdravstvo Primorsko-goranske županije, Hrvatsko udruženje »Albert Einstein« i Očna poliklinika »Dr B.Vojniković«, Rijeka, ugovorile su petogodišnji projekt studije o zdravstvenom stanju vida u djece Primorsko-goranske županije. Prvenstveni zadatak bila je studija o oštećenju vida u djece zbog dužeg izlaganja očiju sunčevoj svjetlosti. Ispitivanja su provođena na području triju lokacija s pretpostavkom o različitoj insolaciji: otok Rab, Novi Vinodolski i Delnice. Raspon starosti djece bio je od 9–14 godina, a u studiju je uvršteno ukupno 189 djece. Osim rutinski određenog vida obavio se pregled prednjeg segmenta biomikroskopom, fundusa oka te se izmjerio očni tlak. Kod određenog broja djece sa sumnjom na određenu bolest: makularna degeneracija, glaukom i refrakcijska anomalija, učinjene su dodatne pretrage: glaukomska obrada, vidno polje, OCT i detaljna refrakcija oka. U ovoj studiji posebno se posvetila pažnja refrakcijskim anomalijama u ove tri različite regije. Ustanovilo se da je najteže stanje na području Novog Vinodolskog, gdje čak 40% djece ima neku refrakcijsku anomaliju, zatim na otoku Rabu (17%) i Delnicama (9%). Posebno je potrebno napomenuti da je na otoku Rabu prije 50–60 godina bila vrlo rijetka pojava neke refrakcijske anomalije u djece.